
# Green Planet Architecture

## A METHODOLOGY FOR SELF-SUSTAINABLE DISTRIBUTED RENEWABLE ENERGY ECOSYSTEMS

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# Outline

- **Background**
- **NASA Green Lab**
- **Geospatial Intelligence**
- **Potential Biomass Resources**
- **Community Ecological Cycles**
- **Conclusions**

# Background

- Where we are now:
  - Dependency on four major crops: wheat, maize, rice, and soybeans
    - Food and feed = requires energy!
  - Climatic change
  - “Drying up” of freshwater resources
    - Brackish water remediation

# Background

- Addressing the issues:
  - Use current and emerging technologies to asses the state of the ecosystem
  - Create global distribution networks
  - Climatic adaptive biomass sources

# Iterative Experiments Modeling: Efficient NASA-unique approach to aviation biofuels

**Example:** Optimizing microalgae/cyanobacteria biofuel properties

## Integrated Biology/Transport Models

Micro models

**Basic biology:**

- Metabolism, energy conversion, growth, exchange /environment

Micro-macro model

**Coupling to large-scale transport:**

- Distribution function

Macro model

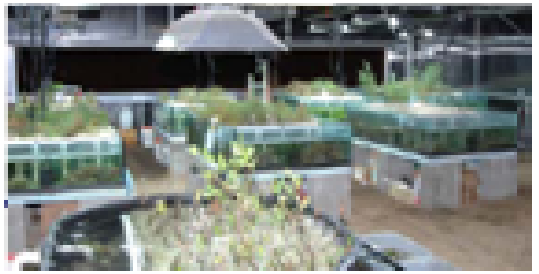
**Large scale transport processes:**

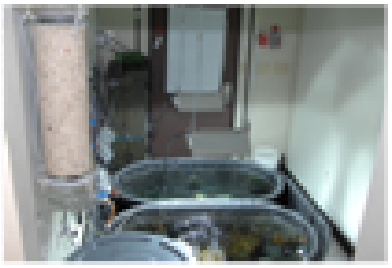
- Overall geometry, light, flow, nutrients
- Process optimization

Experimental Testbeds

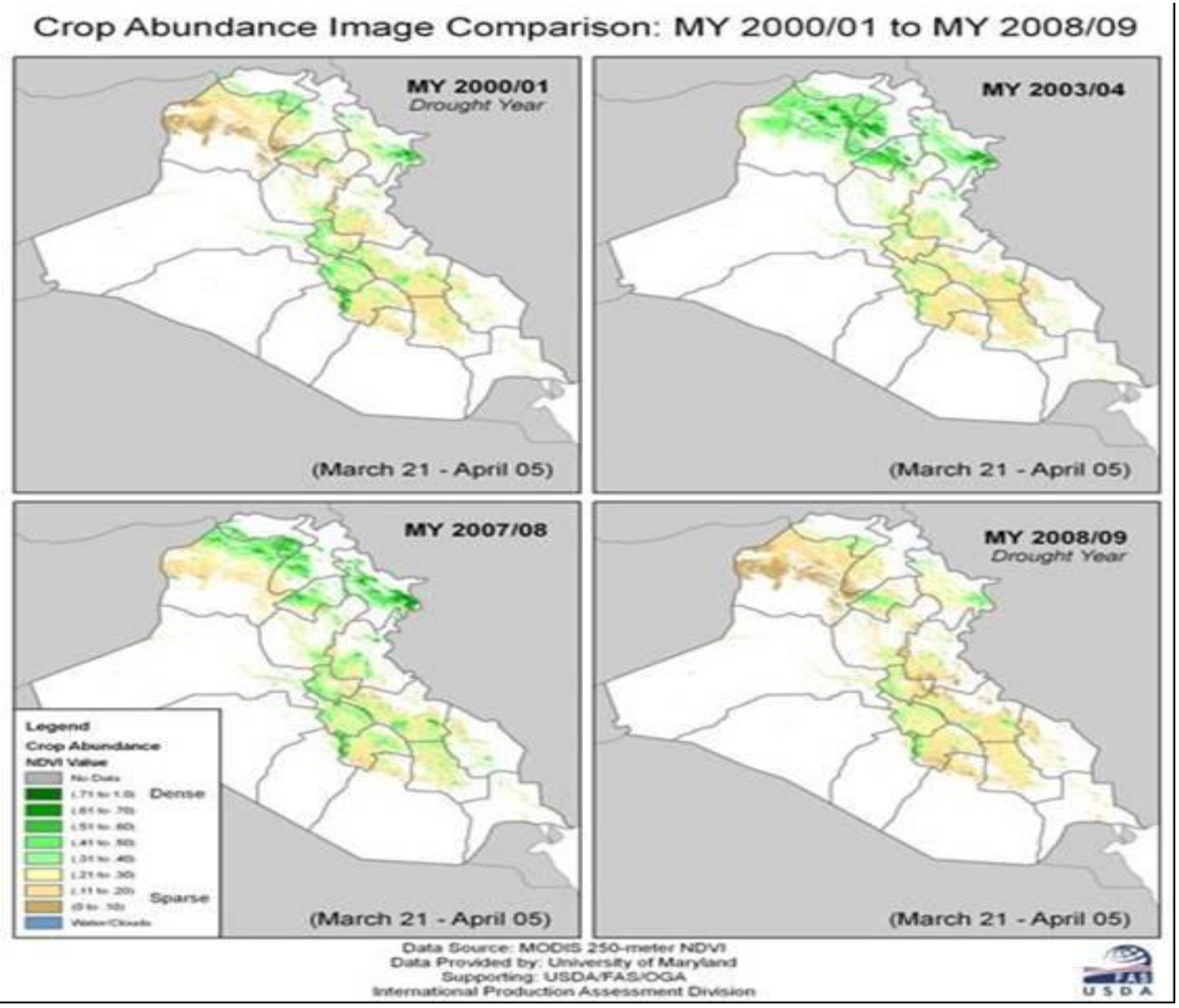
## Integrated Experimental Facility

- Measure model input parameters
- Iteratively validate model designs
- Provide independent data for halophyte production





# Geospatial Intelligence




MODerate-resolution Imaging Spectroradiometer (MODIS) Normalized Difference Vegetation Index (NDVI) chart displaying crop abundance over time in Ninewa Province, Iraq.

# NASA Earth Science Decadal Survey Studies

- Space-observation systems
  - Gather information the dynamics of the climate and ecosystem
  - LEO and SSO orbits
  - Various Surveillance Programs

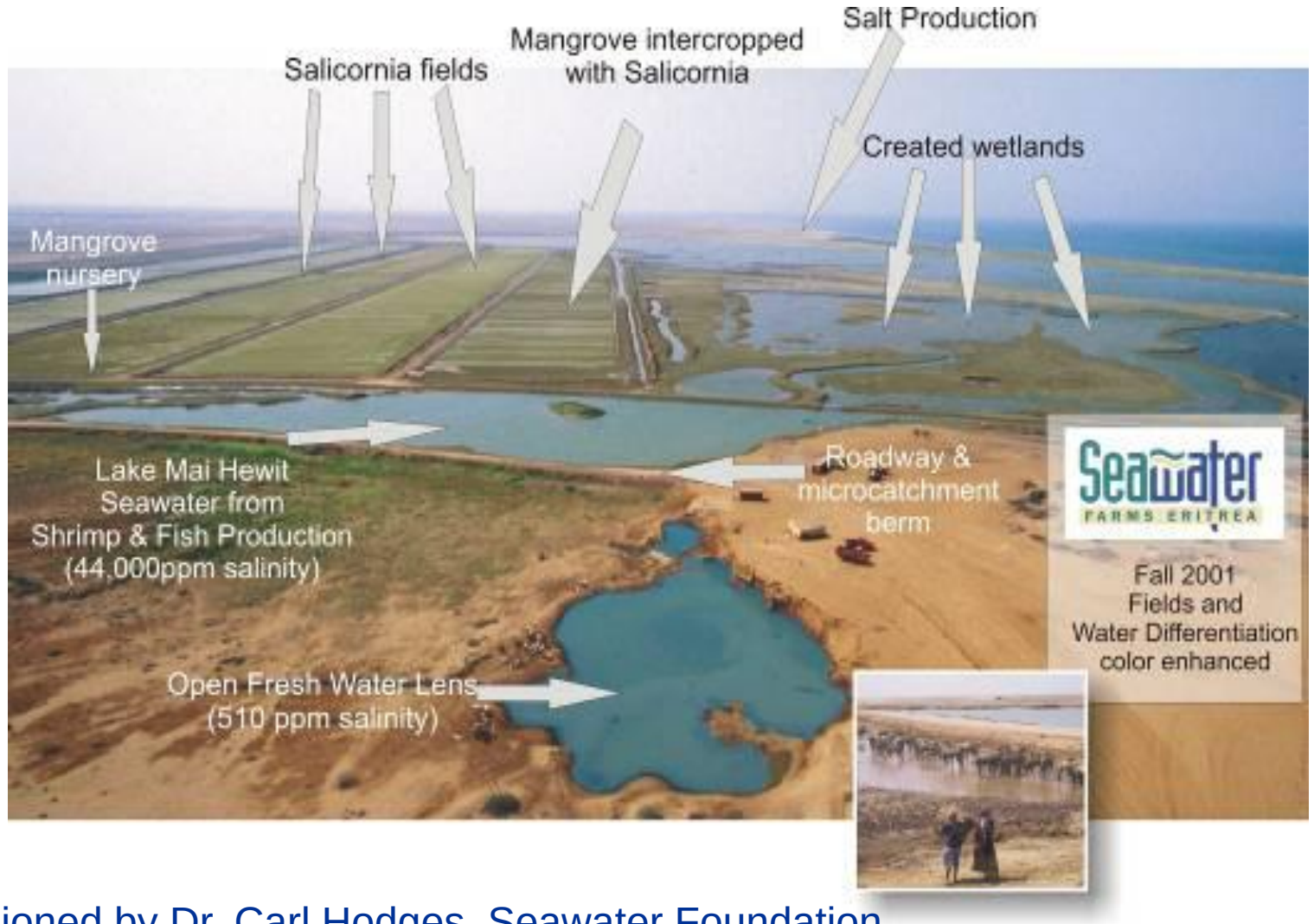
  and applications to Green Planet Architecture

- High-performance Computing (HPC)
  - Processing of large data sets

# Potential Biomass Resources

1. Seashore Mallow
   - perennial that grows on coastal marshlands or brackish lakes
2. Salicornia and Mangroves
   - been studied for food, feed, fuel and salt retention
3. Halophyte trees and shrubs
   - energy and carbon credit resources
4. Algae Systems
   - too expensive to be considered as a fuel source only
   - very productive and profitable as a niche market source
5. Castor Beans
   - crop for semi-arid to arid lands
   - not a true halophyte, climatic adaptation is currently being tested
   - castor bean oils have been processed to SPK-HEFA (HRJ) aviation fuels

# Large community ecological cycles




As envisioned by Dr. Carl Hodges, Seawater Foundation

# Conclusions

- **NASA Green Lab**
  - New and integrative ways to view future green planet alternatives
- **Geospatial Intelligence**
  - Forming a broader understanding of the Earth to formulate new ways to maintain and improve its health and serve our energy needs
- **Potential Biomass Resources**
  - Finding viable alternatives to meet future needs
- **Community Ecological Cycles**
  - Optimizing resources, expansion and combination of Green Lab and other projects

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# Thank you
# Questions?